FOUNDATION INSTRUMENTS
LIGHTWAVE GROUP

# OPERATION AND MAINTENANCE

# MANUAL

# For

# OPTICAL ATTENUATION TEST SET

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## 0 INTRODUCTION

This manual is intended to provide information for the operation and maintenance of the Optical Attenuation Test Set manufactured by Foundation Electronic Instruments Inc.

## 1.1 GENERAL DESCRIPTION

The Foundation Electronic Instruments Inc. Optical Attenuation Test Set is useful for the installation and maintenance of fibre optic links.

The test sets consist of two totally independent units: one a receiver and the other a transmitter.

The transmitter consists of a temperature stabilized constant output light source. Both low and high power LEDs are available. A variety of optical connectors are available to launch light into the fibre.

The receiver is a microprocessor-based instrument, capable of measuring optical power in either linear or log modes. The log modes may be referenced to either milliwatts or to a reference level set by a momentary switch. Linear power may also be displayed. Two thumbwheel calibration switches may be used to correct for changes in responsivity of the photodiode with temperature.

Both units are portable, battery operated and provide in excess of twelve hours of continuous operation. The units are capable of operating and charging simultaneously.

## .0 SPECIFICATIONS

### Transmitter

| | |
|---|---|
| Modulation | Constant power −15 dbm |
| Stability | .1 dB, -10°C to +40°C |
| Power | 10 VDC Internal rechargeable battery or 120 VAC 60 Hz charger |
| Operating Time | >12 hrs 0°C to +40°C |

### Receiver

| | |
|---|---|
| Modes | Log or linear |
| Range | Log +10 dBm to -80 dBm<br>Linear 10 mW to 10 pW<br>Reference Input 10 mW to 10 pW |
| Stability | .1 dBm -10°C to +40°C |
| Accuracy | > .1 dBm between +10dBm and -65dBm<br>> 3 dBm between -65dBm and -80dBm |
| Power | 10 VDC Internal rechargeable battery or 120 VAC 60 Hz charger |
| Operating Time (on full charge) | > 12 hrs 0°C to +40°C |

## 3.0 OPERATING INSTRUCTIONS

### 3.1 Transmitter

1. Open case.
2. Connect fibre optic connector to optical transmitter head.
3. Turn power switch to the PWR ON position. The PWR ON LED should light. Should the BATT LOW LED come on, the AC charger must be used (see Section 5).
4. The transmitter is now available for use.

### 3.2 Receiver

1. Open case.
2. Remove from pouch, located in lid of the receiver, the corresponding optical receptacle needed to mate with the fibre optic connector on your fibre (Siecor, Deutsch and bare fibre holders are available).
3. Connect the optical receptacle to the black optical receiver head. Insert the fibre optic connector into the receptacle and screw on.
4. Set mode switch to ABS. (dBm).
5. Set detector calibrate switch to 0 0.
6. Turn power switch to ON position.
7. If low battery indicator comes on, the charger will have to be used (see battery charging).
8. Set switches to desired mode and read power from LCD display (see front panel switches and indicators, Section 6, for details).

## .0 MAINTENANCE

Although the OATS transmitter and receiver units are portable field units and relatively maintenance free, certain precautions must be taken.

Avoid getting the unit overly damp from outside use. Although the unit is somewhat water resistant, water may still seep into the box.

Should the photodiode optical head be removed from the receiver, avoid getting dirt or any foreign material into the unit.

## .0 BATTERY CHARGING

The transmitter and receiver units both have individual 120 VAC AC chargers. If the unit requires charging, as indicated by the front panel indicators, remove the adapter from the unit. Plug the appropriate AC adapter into an AC wall outlet and the other end of the AC charger cord into the power jack on the unit. The transmitter and receiver will normally require recharging after 12 hours of use. The AC adapter will still charge the batteries with the units under use.

## .0 FRONT PANEL SWITCHES AND INDICATORS (RECEIVER) (Fig. 1)

### .1 OFF/ON/STBY

By turning this switch from the OFF position to the ON position allows the unit to be ready for use.

The standby position allows the user to retain a stored reference in memory while the unit is in a power-down state.

### .2 ABS(dBm)/REF(dBr)

When this switch is in the absolute position ABS (dBm) all incoming optical power to the unit will be referenced to one milliwatt of optical power (dBm).

By placing the switch to REF (dBr), all incoming optical power will be referenced to the reference power level inserted. The optical signal measured may be either greater or less than the reference inserted, thereby giving both positive and negative log values. When in the reference mode (dBr), should no reference have been inserted, a set of dashes will be displayed on the LCD indicating an invalid reading.

### .3 LOG/LINEAR

This momentary-down switch will normally sit in the LOG position. The LCD display will indicate a log value referenced as described in section 6.2.

With the momentary switch held down in the linear position, the display will show linear power. The last digit on the LCD display will indicate the value of the power being measured. The power could be in any one of four ranges: pico watts, nano watts, micro-watts or milliwatts. When all three segments of the last digit are displayed, the power measurement displayed will be milliwatts.

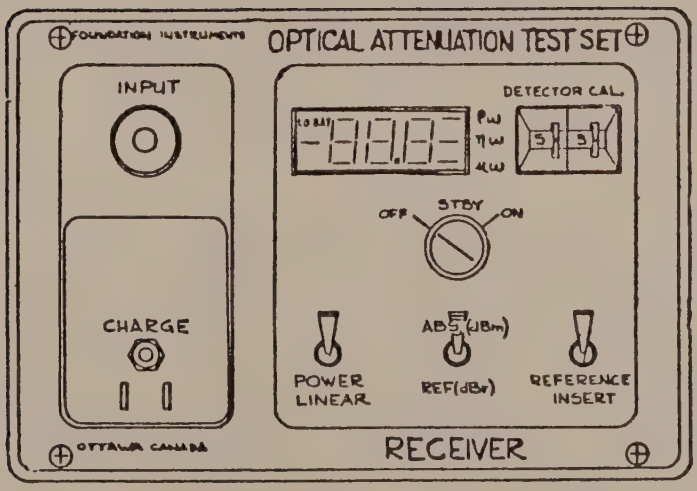


Figure 1 Optical Receiver

In the linear mode the unit will not update the output continuously. Therefore should the input power change, the user will have to release the linear button to allow the unit to update its incoming power.

## 6.4 Store Reference

With the momentary switch in its normally up position the receiver will run as specified by the above switches. When the switch is depressed, the incoming optical power to the unit will be stored as a reference for measurements in the (dBr) mode of operation. A new reference may be inserted simply by depressing the switch again.

## 6.5 Detector Cal.

The dual BCD encoded thumbwheel switches allow the user to vary the responsivity associated with the photodiode. Since the responsivity or efficiency of the photodiode varies with temperature, this may be corrected by setting the thumbwheel switch accordingly. This compensation factor may be varied anywhere between 1.49 to .50 of the nominal value of the responsivity. Any value dialed below .50 indicates an increase in the responsivity of the photodiode with the leading 1 deleted. All values above .50 indicate a decrease in responsivity.

## 6.6 Log/Linear and Store Reference

By first depressing the log/linear momentarily switch and then depressing the store reference switch, the linear value of the reference will be displayed. The reference value inserted will not be effected as long as the log/linear switch is depressed first. Should no reference have been inserted, the display will read □ L.

## 6.7 Low Battery Indicator

A low battery indicator on the LCD display will indicate the charged level of the battery.

## 6.8 LCD Display Indicators (LP, □L, ---, +, -)

The LCD will display various symbols depending on the condition of the unit. Should the incoming optical power be lower than the acceptable limit, the unit will display LOW POWER (LP). This display will over ride all others to ensure that a valid reading is taken.

With incoming optical power greater than the acceptable limit the display will show OVER LOAD (OL).

Dashes will be displayed should the receiver be set to log reference without a reference inserted.

Positive and negative signs indicate the log polarity of the signal measured with respect to its reference.

## 7.0 FRONT PANEL SWITCHES AND INDICATOR (TRANSMITTER)(Fig 2)

### 7.1 On/Off

Switching this switch from the OFF to ON position allows the unit to be ready for use.

### 7.2 Low Power

The LED indicates if the battery voltage is below an acceptable value.

### 7.3 Power ON

This LED indicates that the power is on and available to the internal circuitry.

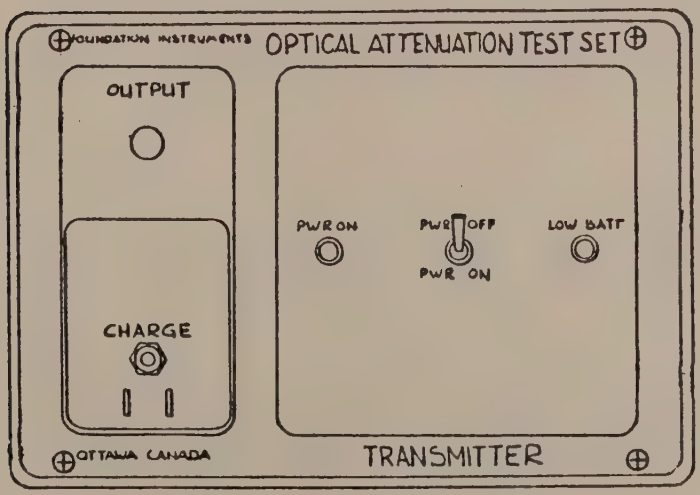


Figure 2 Optical Transmitter

## 8.0 THEORY OF OPERATION

### 8.1 Receiver

The receiver circuitry may be split into four different sections: the microprocessor, the analog input, power and the display section (see Figure 3).

The input light level is directed to the PIN diode where it is converted to a current of nominally .5 μA per μW of optical power. The current is converted to a voltage level and amplified by the front end. From the A/Ds sampled analog voltage, the microprocessor makes a decision as to whether the reading is valid and in the right range. The processor will vary the range selection until a valid reading is located. The micro processes the information in the mode specified by the front panel switches and displays the information appropriately formated. Memory (RAM) for temporary storage of information is available to the processor.

### 8.2 Transmitter

The transmitter consists of a relatively simple current control to ensure constant light output independent of temperature, battery voltage and LED aging (see block diagram Figure 4).

The operation of the circuit may be described simply by the following: a regulated voltage source drives the LED with a constant current. The current is thermally compensated to achieve flat optical output power with varying temperatures.

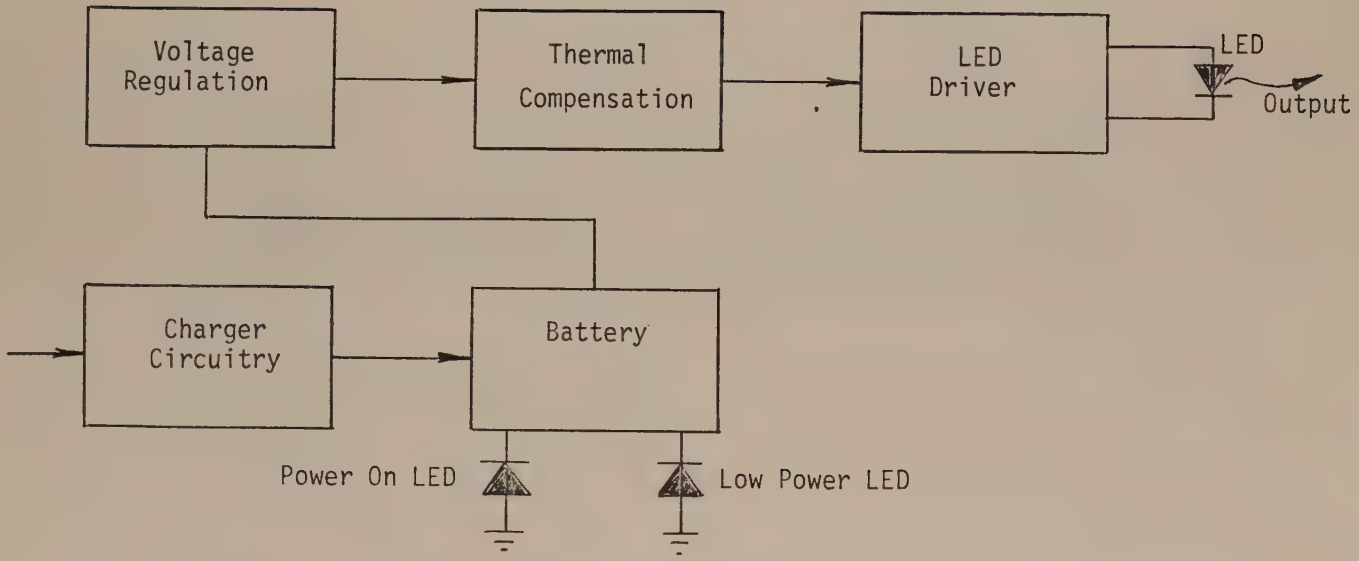


Figure 4 Transmitter

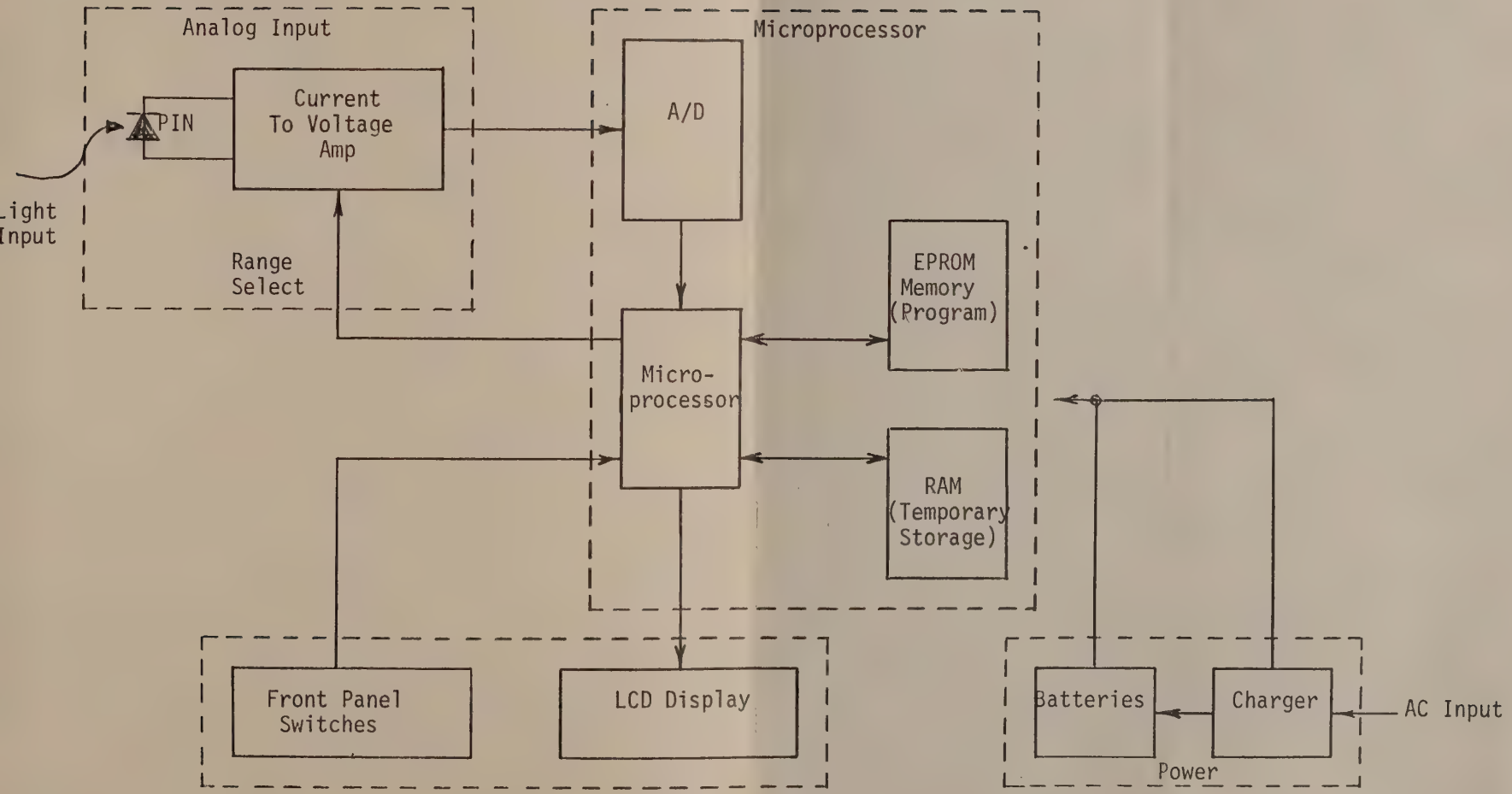


Figure 3 Receiver

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